

## **MODIS Team Meeting Minutes**

### **Minutes of the MODIS Team Meeting held on Tuesday March 22, 1994.**

#### **Action Items:**

73. Complete the MODIS brochure and released for printing. Assigned to Bauernschub 10/18/93. Due 11/15/93.

75. Determine if the four electronic module boxes can be individually thermal tested in air, or must the thermal testing be done in a vacuum. Assigned to Silva 10/26/93. Due 11/ 9/93

86. Complete CDR Action Items. Assigned to ALL 3/15/94. Due 4/ 7/94

#### **The following items were distributed:**

- 1) Weekly Status Report #130
- 2) SBRC Memos submission from week #122
- 3) Minutes of the previous team meeting

#### **Attendees:**

✓ Dick Weber	Bruce Guenther	Larissa Graziani
✓ John Bauernschub	✓ George Daelemans	✓ Bob Martineau
Rosemary Vail	John Barker	Bob Silva
Lisa Shears	Patricia Weir	Ken Brown
✓ Mike Roberto	✓ Mitch Davis	✓ Robert Kiwak
✓ Nelson Ferragut	Jack Ellis	✓ Harvey Safren
✓ Gene Waluschka	✓ Ken Anderson	✓ Ed Knight
Kate Forrest	✓ Rick Sabatino	Harry Montgomery
✓ Bill Barnes	✓ Cherie Congedo	Marvin Maxwell
✓ Les Thompson		Bill Mocarsky/ Rick Mills

### **Team Meeting and Other Topics**

**March 22, 1994**

#### **SUMMARY**

We welcome Bill Barnes back to work.

The availability of acceptable kinematic mounts for vibration testing in Florida in June remain a real concern at this time.

The CDR Action Item responses assigned to GSFC personnel are due to John Bauernschub on or before April 7th. Send in comments via telemail. Just identify the number of the action item and your response.

There will not be a team meeting on Tuesday, March 29th.

The calibration peer review is scheduled for April 13th and 14th. The review will be held near GSFC.

With descopes and severe spending restrictions and manpower reductions taking place on the MODIS program at SBRC, it has become very important for our engineering team to perform more of the analysis work at GSFC. Also, where we differ with SBRC in analysis results, we need to try to do more here to resolve the differences. SBRC is being forced to stop or reduce important analysis work, which means we will be finding more problems after we are in test. The test program is also under pressure which means more problems will be found at higher levels of integration. Significant risk is being forced into the MODIS program, and GSFC needs to do all that is possible to help mitigate this risk.

Ray Taylor mentioned a jitter measurement system from Langley is being considered for EOS.

## **DISCUSSION**

### **System Engineering and Calibration**

The regular weekly telecon was held on Monday, March 21 st. Attendees at SBRC included Tom Pagano, Neil Therrien, Jim Young, and Dzung Phan. At GSFC, attendees were Bill Barnes, Ed Knight, and Mike Roberto.

We discussed the rotary table for MODIS. GSFC would like to have instrument thruput measurements as a function of scan angle. This could be for a few scan angles. There must be a low cost rotary table which could be obtained. SBRC will consider a rotary table. However, it is possible that the instrument could be positioned at different angles. There is the question of the cost of the fixture to handle the MODIS cables if a rotary table is used.

We discussed the status of the kinematic mount work at GSFC. I mentioned that I have recommended that new mounts be designed and built for the June test at Honeywell in Florida. However, the analysis and mount inspection work by Code 720 is ongoing to determine if the existing mounts are good enough for the June vibration testing of the MODIS mainframe.

There was a question about the measured uniformity of the output across the aperture of the 100 cm Spherical Integrating Source (SIS). SBRC has not measured this; however, Labsphere measured variations in the 1.5 % range.

Ed Knight wanted to be sure that GSFC receives filter test data of tests that have been completed. This is so GSFC can analyze this without delay. There was the question of processing deviation waivers now. Tom believes that for some of the filter characteristics, SBRC needs to measure system response before knowing if a deviation will be needed.

Ed followed up on the Thursday, March 17th calibration peer review dry run:

- 1) The use of the Blackbody calibrator when solar diffuser port is open is a question because of possible stray light.
- 2) From the Barr witness samples, SBRC is getting filters for the Solar Diffuser Stability Monitor (SDSM). GSFC and the University of Arizona would also like to purchase extra filters from these samples, if available.
- 3) For electronic calibration (ECAL), there is the question of whether we could get better than the current resolution. The ECAL is a noise source with noise on the order of 1 bit in a 12 bit system. The current resolution is 4 %. By changing the offset, it may be possible to get all 4096 bins.
- 4) There was some confusion over SRCA models and algorithms identified in the CDR. These are spreadsheets for SRCA operation and flowcharts for the SRCA calibration algorithms. Calibration algorithms that have flowcharts will be updated by SBRC. Ed is requesting to see the updates when they become available.

5) There is a question about SRCA bulb testing. What configurations have to be tested prelaunch. Ed will send an email of this to us and SBRC. Ed thinks the minimum test uses 22 or 23 combinations of bulbs.. At this time, Eric Johnson is planning on 20 combinations.

Tom mentioned about the Engineering Model (EM) test plan. The idea is to build up a fully functional EM. Parts of the EM would be changed out to turn it into the protoflight model. Tom will provide the details of the current plan to do this to GSFC.

Tom is recommending deleting many of the 20 to 30 CDRLs for systems engineering. These would be generated in test procedures and reports.

The MSAP Params file is being updated. The new file will be ready by the time of the QMR.

The MODIS simulator math model has been moved over to a Sun workstation. SBRC is looking into making use of PV Wave for the simulator. Some information of the simulator will be ready by April 1 st. SBRC is modeling the electronics; they are now looking at gains and offsets for the PC channels.

Jim mentioned that if NASA wants SBRC in the audience at the calibration peer review, NASA better say so, else no one from SBRC will be there. Jim will be doing a view graph for the review.

The 100 cm SIS will not be ready for calibration round robin in May.

### **Structural Analysis**

Cherie Congedo mentioned that for the rest of this year, she believes SBRC has only 1.5 man years of structural analysis they can perform. Some incomplete structural analysis work has been stopped. The analysis of the Main Electronics Module (MEM) which is part of the load bearing structure was stopped before completion. Some analysis identified by SBRC for the radiant cooler will not be performed.

Cherie believes that thermal vacuum testing of the radiant cooler should include detectors. The test may then provide information on the PC detector cracking problem.

### **Electronics**

There is a question about the fall back position if the Plessey 31750A microprocessor chip is not available for MODIS. Mitch Davis will discuss this with SBRC.

### **Mechanics**

Nelson Ferragut is working with Gene Gochar to determine what additional mechanism information is needed by the CDR review team. Gene Gochar will be at SBRC next week for additional review of mechanisms. Nelson has coordinated this effort with Bob Joyce, Gene Gochar, and Al DeForrest. Mechanism people, who are now part time MODIS, will be available to meet with Gene and Nelson on Tuesday and Wednesday. Mike Hagopian will also be at SBRC and may participate in the error budget discussion for calibration of the optical encoder.

### **Kinematic Mounts**

A meeting on the kinematic mounts was held on Wednesday, March 23rd in Bill Case's office. Attendees included Mehmet Basci, Jim Mayor, and Pete Weinberger of Swales, Steve Brodeur, Ken Hinkle, Brad Parker, Cherie Congedo, Nelson Ferragut, and Mike Roberto.

Basci mentioned that the key consideration is how you come up with the stresses, as Nelson had previously mentioned. Basci agrees that effective stress concentration factors (based on geometry and physical properties) need to be considered for our mounts.

Brad Parker of Code 313 will put a crack in the specimen. Jim Mayor will provide initial crack size. Brad can measure with confidence an initial crack which is equal or greater than 0.1 inches in length on flat specimens. Probes for eddy current measurements are on order. The best guess for delivery at this time according to Brad is mid April (could be later). The kinematic mounts have been peened and tiodized (sp). There is a question on the impact on the eddy current measurements on a part that has been peened (hit with small balls which might tend to cover cracks).

Jim Mayor presented preliminary calculations based on the NASA fracture analysis program (FLOGRO) using a round bar model:

- 1) For the current design, it may be difficult for Brad Parker to detect the required crack size. The details are being worked by Jim and Brad. Jim's analysis is continuing.
- 2) If we change to A-286 stainless, Jim's initial calculations showed an improvement of about an order of magnitude in the number of lifetimes the mounts could handle. The required initial crack size for the stainless mount should be easier to detect. It still needs to be determined whether or not the current design would be acceptable if the material was changed to stainless steel.

On March 23rd, Oscar Weinstein faxed me a copy of the Honeywell vibration plan for the June test in Florida. I provided a copy of this plan to Jim Mayor on March 24 th, with comments that some of the values will be updated. Because of the non-linear performance of the mounts, the decision may be made to sine sweep up and down in frequency. This would double our low level sine sweep. The level needed for the low level sine sweep may not be known until the test is started. A qualification level sine sweep is a new test in the proposed update to the GIIS. Jim has Nelson's information on the vibration test program in Florida.

On March 24th, a copy of Nelson's March 17th calculations on the number of cycles for the kinematic mounts in Florida testing and a copy of the March 4 th Martin Marietta memo on "Fatigue Life Evaluation of EOS 2-Axis Kinematic Mount" was sent Federal Express to Jack Brooks at SBRC for his information.

There was a discussion on mount inspections with Brad Parker on March 25th:

- 1) At this time Brad is relying on eddy current tests to examine the current mounts. However, there is a chance that it will not be possible to see a crack of the size required for the fracture analysis (I think this is a very real possibility). There is the question of the impact of peening on the accuracy of the eddy current tests.
- 2) A dye penetrant examination of the mounts may not be possible because the mounts were peened. However, if the existing mounts were proof tested after they were peened and tiodized, there might be some benefit to a dye penetrant test. If this is possible, there would still be the issue of contamination.
- 3) Ultrasonic tests are difficult for these mounts because of the geometry.
- 4) One possibility may be stripping existing mounts and doing a dye penetrant inspection. For a ground test program, tiodizing might not be necessary. There may be dimensional and other concerns related to stripping existing mounts. These need to be discussed with Tom Venator and others.

## **Thermal**

George Daelemans mentioned that the temperature sensors on the electronics boards have been placed for convenience. Analysis was not used to determine where the sensors should be placed. This makes it very important that at least one thermal test be done which is well instrumented with test thermocouples at important locations on the boards. This may make it possible to calculate temperatures of these important places on the electronics boards in later tests. The flight temperature sensor readings would be used to

deduce the temperatures of important board locations which previously had test thermocouples. The goal is to include the requirement for the use of these test thermocouples in the specification.

George has studied the effects of pitch/hold maneuvers on the temperature of the radiant cooler. The initial cool down on orbit of the radiant cooler to 85K is expected to take 4 days. It takes three days to recover from a one orbit of pitch/hold which takes the cooled focal plane up to 130K. After 14 hours of a pitch/hold maneuver, the cooled focal plane gets up to 230K. Results are in an upcoming memo.

The focal plane now dissipates 58.5 mW. The spec was 54 mW. This raises the focal plane temperature by 0.5 degrees.

### **Focal Planes**

Bob Martineau mentioned there are focal plane problems related to the locations of mounting holes drilled in the cables. The major problem is holes are off center. For one instrument, seven W1 cables are needed to yield 4 for focal planes. SBRC has one W1 cable. SBRC needs 1 W2 cable and has 4.

There were 8 protoflight S/MWIR wafers in lot one of which 6 wafers were probe tested. Three sets were ranked as useful. SBRC needs 5 or 6 sets. They are going back to look at questionable arrays.

For the read out integrated circuits (ROIC's), lot 3 is looking good and has identified parts for all builds. Lot 4 meets specifications but has a wider spread. Lot 5 is looking good. Note this is not yet at the Sensor Chip Assembly (SCA) level.

For the S/MWIR fanout detector assemblies (FDA's), there are 4 with subarrays and 4 with full arrays. The expectation is that after probe testing for continuity checks, there will be 3 with subarrays and 3 with full arrays that will be good enough for temperature cycling. The plan is to make the hybrid closer to a flight configuration before temperature cycling by epoxying the sapphire motherboard to Invar (supposed to be similar in CTE to beryllium (this is questionable)). The detector is indium bump bonded to the readout; epoxy is used to attach the readout to the sapphire motherboard. The thought is that the Invar may tend to limit some of the dimensional changes during temperature cycling and reduce indium bump bond failures.

Mike Roberto March 25, 1994